

O&M Lessons Learned

Unique Challenges and Benefits of Operating High Performance Green Buildings

NASA Goddard Space Flight Center's Building 34

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The Exploration Sciences Building – B34



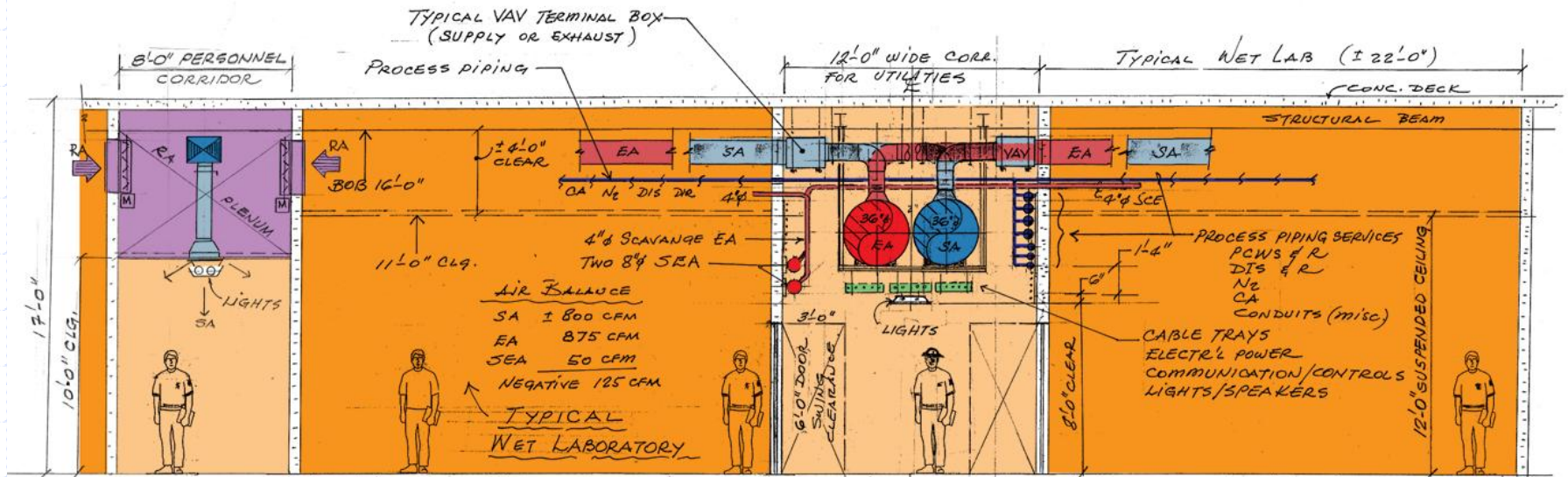
Background

- Goddard Space Flight Center's Building 34 is the first NASA sustainable facility with a major lab component.
- B34 is 200,000 gross sqft, 3 story office; 2 story laboratory facility, containing both research laboratories as well as office spaces.
- Laboratory space types range from "dry" electronics to "wet" chemistry functions.
- The lab block also contains 2,500 sqft of class 10,000 clean rooms.
- A centralized laboratory hazardous exhaust system allows for large variety of lab exhausting requirements to be met with a common system distributed throughout the lab block.
- Laboratory space accounts for a third of the building program.

Utility Corridors

- Innovative layouts enable the successful long term operations and maintenance of high performance facilities.
- Research experiments often need minimal interruption of facility services. It's important that these laboratories operate with minimal interruption from outages or preventive maintenance operations. Laboratory building support equipment needs to be in accessible locations that are non-invasive to the ongoing science operations.
- B34 utility corridors allow for reasonable O&M access to building services and laboratory isolation from outage impacts.
- The corridors also allow for additional laboratory space to house noise generating laboratory equipment such as vacuum pumps.

Utility Corridors



LEGEND

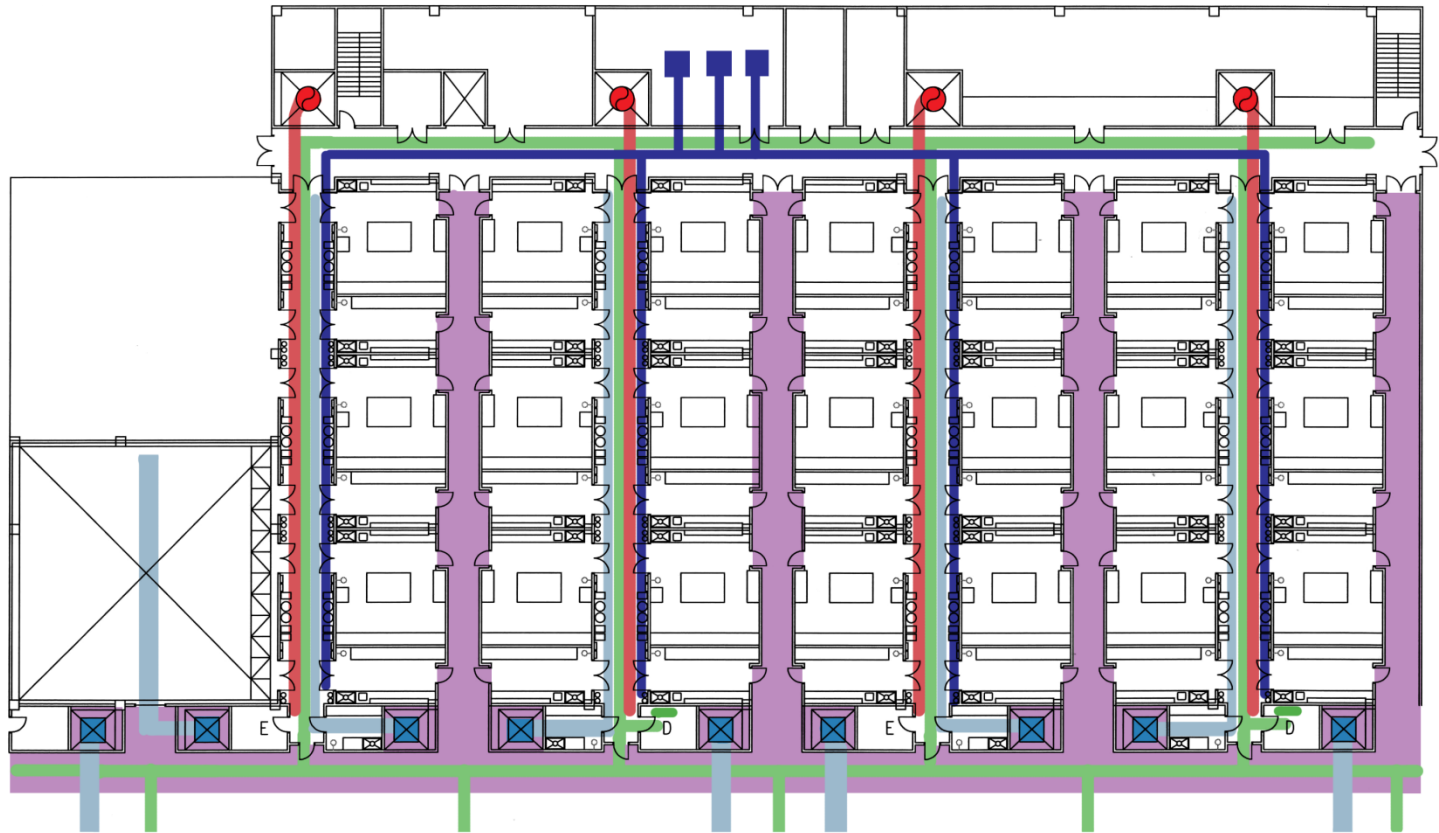
SA	SUPPLY AIR (HVAC)
EA	EXHAUST AIR
SEA	SCAVANGING EXHAUST AIR
PCWS	PROCESS COOLING WATER (SUPPLY/RETURN)
DIS	DEIONIZED WATER (SUPPLY/RETURN)
CA	COMPRESSED AIR
N ₂	NITROGEN

TYPICAL SECTION THRU

UTILITY CORRIDOR

SCALE: 1/4"=1'-0"

Utility Corridors



Centralized Hazardous Exhaust System

- This system allows for large quantity of lab exhausting requirements to be met within the consolidated lab block.
- Individual exhaust systems would not have fit well within the given building envelope and roof areas. A large centralized system common to all of the lab spaces allows for the best utilization of building space and the ultimate flexibility for the science operations in the buildings.
- The B34 system utilizes four large rooftop fans and is N+1 redundant by design. In practice due to the specific capacities of the equipment installed and fine tuning of the controls the system now operates at an N+2 redundancy. It's far less maintenance intensive to operate the four B34 fans verses individual fans.

HVAC Control Complexity

- Complex control schemes and redundant systems can be challenging from a maintenance perspective. Additional training is important to successfully pass on detailed information of the operation of more complex systems. This is an area where thorough commissioning is crucial. Provide additional design details for any unique requirements for the control sequences.
- Additional training for maintenance staff for complex or new technology systems. Involvement of maintenance teams - O&M involvement during design and throughout construction.
- Beef up A&E spec on commissioning - Identify all commissioning checklists as a part of the construction documents. An example is; specify the commissioning agent to run the building through real-life failure scenarios such as automatic restart from electrical power loss.

Benchmarking

- When touring outside facilities for benchmarking of approaches; it's beneficial to capture the O&M perspective of how these features help or hurt the maintenance and operation of these facilities.
- The team examined interstitial space as a solution to equipment accessibility without impact to operations. While this was a widely accepted approach it did not survive project budget challenges.

Energy Savings

- The signed LEED Letter Template, summary tables, and energy modeling output demonstrated a 19.3% savings between the budget and design cases in comparison with ASHRAE 90.1-1999. Energy efficiency measures include a thermally efficient envelope, efficient lighting, high efficiency motors, fan speed control, low pressure loss HVAC design, and demand control ventilation.

Customer Education

- Identify unique procedural requirements for the building occupants. Example: What does the fume hood alarm really mean? The design team can identify what a particular alarm or problem means to the system and the Lab Chief responsible for overall laboratory safety could develop the correct procedural response. Close coordination between design team and the Lab Chiefs would allow for both prompt and proper reactions to abnormalities with the building systems.

Maintenance Ownership

- Important to identify and obtain understanding of who has maintenance responsibilities. The split between programmatic and institutional equipment needs to be clear so equipment can be properly maintained without negative impact to building operations and construction warranties. Doing this is crucial to preserve the ongoing operations of the building.

Improvements

- An extensive O&M review of as built drawings and O&M manuals - this allows the people who ultimately utilize this information to both become familiar with, and provide focused technical review of this material.